flying a kite with non-rigid edges at Pyrton Hill, and we have been fortunate in breaking only one kite in landing it, and in not failing once since last October to bring back the kite to the starting point without accident; also Mr. Cody's kite, which has non-rigid edges, will certainly fly in a strong wind.

Mr. Fergusson states that a kite of 7 square metres surface will exert a pull of 35 kilograms in a wind of 10 metres per second. In English units this is equivalent to 1 lb. per sq. foot of sail area in a wind of 22½ miles per hour. If the whole area were exposed normally to the wind, the pressure or pull would be 53 kilograms, and hence, remembering that the back sails are partially sheltered by the front, and that the angle of incidence is only about 15 degrees, 35 km. seems a very high value. The pull of a diamond-shaped box kite of 7 metres sail area in the same wind is certainly below 15 km. It would be interesting if Mr. Fergusson would tell us how the wind at the kite is measured at Blue Hill. I do not think any anemometer placed in the kite can be trustworthy—one might as well place one close to the roof of a house amongst a set of chimney stacks—and if an anemometer is placed on the wire there is the difficulty of avoiding oscillation and of correct orientation.

I am glad to be able to state that we do not now officially publish in England values of wind velocity based on the factor 3 for the Kew pattern Robinson cups, but on the factor 2·2. This reduces what would have been called 100 to 73; but the values quoted by me in my letter of March 17 are entirely independent of the Robinson anemometer. For reasons fully given in a recent publication of the Meteorological Office (M.O. 202) those values are doubtful, but the evidence is in favour of their being too low rather than too high.

I should like to take this opportunity of replying to Mr. Gold's criticism of the method of measuring wind velocities on a kite in England, namely, by measuring the tension of a piece of cotton carrying a light sphere at the far end, away from, and out of the influence of, the kite (NATURE, April 21). It is true that the surface of the cotton exposed to the wind is comparable with that of the sphere, but the force is for all practical purposes a normal one, since the tangential component is admitted by all to be very small. It follows that the tension of the cotton, neglecting its weight, is the same throughout, just as in the case of the string stretched on a smooth curve given in text-books on mechanics, and hence the tension measured is the tension of the cotton where it is tied to the sphere, and is independent of the length.

W. H. DINES.

A Difference in the Photoelectric Effect caused by Incident and Divergent Light.

RECENT investigations have shown that the ionisation produced by the secondary rays arising from a thin metal plate traversed normally by a primary beam of Röntgen or γ rays is greater on the emergent than on the incident side. The present experiments were made to see if a similar effect could be detected with ultra-violet light.

Thin films of platinum were prepared by sputtering from a platinum kathode on to quartz plates 1 mm. thick. These could be mounted in the centre of two similar brass cylinders so that their planes were perpendicular to the axes of the cylinders. A narrow beam of ultra-violet light from an arc passed down the axis of the two cylinders normally to the plates. The saturation current from the illuminated plates to the cylinders could be measured. The plates could also be turned so that the film side was either away from (position A) or towards the light (position B).

In every experiment two similar plates were used; one was used as a standard to determine the strength of the ultra-violet light, and its position, whether A or B, was unchanged. The other plate was compared with this for each of the two positions alternately. By referring each measurement to the standard plate, the otherwise troublesome variations of the arc were rendered harmless. Unless the films were very thick it was always found that position A gave rise to a relatively greater photoelectric current than position B, although it was penalised by having to pass through the thickness of the quartz plate.

When no allowance is made for the absorption by the quartz, a very thin film gives 12 per cent. more photoelectric current for the emergent than for the incident light. When the absorption of the quartz is allowed for the difference is increased to 16 per cent.

These results have been confirmed by reversing the direction of the light without altering the position of the plates, and other experiments have been made to ensure that they do not arise from scattered light or other defects in the apparatus. The ratio of the emergent to the incident effect has been determined for a series of films of varying thickness.

This investigation was suggested to me by Prof. O. W. Richardson, and the experiments have been carried out under his direction.

OTTO STUHLMANN, JUN.

Palmer Laboratory, Princeton, N.J., April 26.

A Link in the Evolution of the Bees.

THE ligula or "tongue" of the bees presents two main types, one broad, obtuse, and often emarginate, the other pointed, acute, frequently much elongated. The obtuse-tongued bees have been considered to be the more primitive, and there is no doubt that the most advanced types are long-tongued. The difference between the two groups has seemed so important that at one time (Trans. American Entomological Soc., xxix., p. 185) I entertained the idea that they had no common bee-ancestry, but were derived from different groups of wasps.

Frederick Smith, in 1853, described a new genus of bees from Australia under the name Meroglossa. This was based on a male from Port Essington, which had many of the characters of the obtuse-tongued Prosopis, but had a pointed, dagger-like tongue. Ashmead, in 1899, placed it in the same group as Prosopis, in spite of the tongue; in 1905 (Trans. Amer. Ent. Soc., xxxi., p. 318) I gave an account of Smith's type, remarking that it was "not unlike some Prosopis." In 1905 I described a number of Australian species supposed to belong to Prosopis, but remarked of one of them (*P. turneriana*) that the mouth-parts did not seem to agree with the genus. I had at that time no material for dissection, but Dr. R. C. L. Perkins had such material, and discovered that several had acute tongues. In Proc. Hawaiian Entom. Soc., October, 1908, he founded the genus Palæorhiza for my *P. perviridis*, with the following interesting remarks:—

"Palæorhiza is evidently represented by many species in Australia. Several have been described as belonging to the genus Prosopis, in spite of the fact that the most superficial examination shows that these insects have an acute lanceolate tongue. Hitherto no connecting-link between the blunt-tongued and acute-tongued bees has been recorded, but in Palæorhiza we have a form which, except for the structure of the tongue, would be assigned to the section of Obtusilingues. It will therefore be obvious that this section and the Acutilingues can no longer be maintained as of great importance, since Palæorhiza must always be associated with Prosopis, as the male genital characters, and all other ones, save the lingual, clearly show."

Nevertheless, he proposes for Palæorhiza a distinct family, Palæorhizidæ, at the same time suggesting that it should be Meroglossidæ if Meroglossa is allied.

In the course of going over the splendid collection of Australian bees formed by Mr. Rowland E. Turner, now the property of the British Museum, I have been able to examine the structure of a number of species of Palæorhiza. In the first place, I find that Palæorhiza and Meroglossa are substantially the same genus; but the truly astonishing thing is that the females have broad, obtuse tongues like Prosopis, while the males have sharp, dagger-like tongues! I first discovered this in *P. penetrata*, subsp. *percrassa* (properly *Meroglossa penetrata percrassa*), a black insect with the face of the male canaliculate, much in the manner of the original type of Meroglossa. My natural thought was that there must be two species, in spite of every appearance to the contrary. I next took

the undoubted sexes of *Meroglossa parallela* (Ckll.), a metallic insect related to the type of Palæorhiza, and these showed exactly the same thing. I then looked at a new species (*Palaeorhiza* or *Meroglossa melanura*), with a honey-coloured abdomen black at apex, the mesothorax striped with yellow and black, and the base of the metathorax finely longitudinally fluted. In this the sexes were associated without a doubt, and the difference in the tongues was as in the others. Still others were examined, all with the same result. It appears that the female in this genus lacks, or fails to develop, the determiner which represents the pointed apex of the tongue. Another peculiar character, a comb on the first two joints of the maxillary palpi, is common to both sexes of Meroglossa.

Another generic name for Australian bees must fall. The study of additional material shows that my Prosopisteron is not valid; its type-species must be known as *Prosopis serotinella*.

The extraordinary *Pachyprosopis mirabilis* of Perkins, described from N. Queensland, without further data, was taken by Mr. Turner at Mackay in May, 1900.

T. D. A. COCKERELL.

University of Colorado, Boulder, Colorado, U.S.A., April 21.

Fluorescent Absorption.

IN NATURE of January 6 Mr. Burke criticises the conclusions which I drew from my experiments proving that fluorescent absorption does not exist (*Phil. Mag.*, 1909).

The method which I devised was a direct one, and free from all sources of error. I cannot see any point in Mr. Burke's criticism; I used a scheme for making the source of light and the fluorescing absorbing cell intermittent, throwing the flashes either "out-of-step" or "in-step" at will. If the flashes were out-of-step, the light from the source traversed the absorbing cell while it was not fluorescing. This flash entered the eye, and was immediately followed by the flash of fluorescent light from the cell, the source being in darkness during its emission. The total amount of light, or the sum of the two sets of flashes, was the same whether they were "in-step" or "out-of-step," showing that the absorbing power of the cell was not increased by its fluorescence. Mr. Burke now appears to stand alone as a champion of fluorescent absorption, for Nichols and Merritt have recently repeated their work with improved apparatus and methods (one of them being a modification of my stroboscopic method), and have failed to find any trace of the phenomenon.

R. W. WOOD.

Johns Hopkins University, April 28.

Centre of Gravity of Annual Rainfall.

MR. WATT'S *nil admirari* attitude towards the C.G. of annual rainfall is unfortunate, for, notwithstanding his disclaimer in the first sentence, I find that his statement in the last sentence of his letter in NATURE of April 28 is another *a priori* shot! In the Mysore rainfall annual reports of the last fifteen years I have given diagrams of the monthly rainfall of the eight districts as percentages of the yearly totals, but they are not *simple*, or *similar*, or *symmetrical*. Yet year after year there is a close agreement in the C.G., or date round which each year's rainfall balances. *Verb. sat, sap.*

J. COOK.

30 Hermitage Gardens, Edinburgh, May 3.

Impure Manganese Di-oxide.

A FEW weeks ago I had occasion to order a quantity of manganese di-oxide for general lecture and laboratory experiments, and we duly received the same from a well-known firm the name of which it would be invidious to mention. Although in colour the manganese di-oxide was normal, we soon found that its chemical properties were very erratic. When mixed with potassium chlorate and heated gently, the mass inflamed inside the flask, and a reaction proceeded with explosive violence, resulting in the formation of clouds of smoky gas relatively poor in oxygen. When warmed with concentrated hydrochloric acid the action was unusually vigorous, and an inferior grade of chlorine was evolved possessed of a curious odour resembling that of euchlorine. The black colour of the powder rapidly disappeared, yielding a yellow solution, and a white, insoluble residue, which, from its voluminous appearance, suggested silica.

One of my senior students, Mr. William Davison, thereupon analysed the di-oxide, and obtained the following results:—

	Per cent.
Manganese di-oxide	60·06
Antimonious oxide	33·64
Silica	2·20
Ferric oxide	3·00
Arsenious oxide	trace
Sulphur	trace
Moisture	1·05
	99·95

That this was a case of wilful adulteration I do not suppose for a moment; but it seems desirable to direct the attention of teachers and others to the possibility of such a common and cheap article as manganese di-oxide being sold, not only in an impure form, but in one which it is positively dangerous to use with potassium chlorate for such a simple and universal experiment as the preparation of oxygen.

J. NEWTON FRIEND.

The Technical College, Darlington, May 6.

BRITISH NEW GUINEA.

COLONEL MACKAY was chairman of a Royal Commission appointed to proceed from Australia to inquire into the present conditions of the territory now known as British New Guinea. As such, he proceeded along the south coast of the island to its eastern extremity, then visited the D'Entrecasteaux and other groups in the offing, subsequently proceeding along the north coast to Buna Bay. Here he left the sea and struck inland to visit the Yodda Goldfield, returning overland to Port Moresby. This was the most arduous and interesting part of his journey, for the Owen Stanley Mountains, which here reach about 7000 feet, had to be crossed. Apparently the range really consisted of a series of more or less parallel ridges, up and down which the party was scrambling for seventeen days, camping during much of the time in tropical rain forest.

It is the record of the above trip which "Across Papua" presents to us in pleasantly written form. The expedition was not in any way a scientific one, but the author shows that he has considerable powers of observation. He notes "the absence of stone on the higher ridges, and the extreme narrowness of their root-strewn, moss-carpeted crests. How also, as we approached the higher altitudes, lichen and moss gradually enveloped the timber until they covered limbs and leaves alike; but what impressed me most was the serene calm that reigned over all, for I heard no crash of fierce or fearful animal, no sound of human voice, no song of radiant bird in all that kingdom of mist and sunshine, of sparkling dew-gems, and immemorial silence."

The truth of this traveller's description we know well, but what wealth it suggests to the tropical naturalist—the enormous variety of plants which make up such a forest, each with its peculiar insects, many lizards and frogs showing quite peculiar adaptations to their damp environment, peculiar land shells on every ridge. The natives live on the lower slopes, but seem to be less cannibal and of better stock than

[1] "Across Papua." Being an Account of a Voyage Round, and a March Across, the Territory of Papua with the Royal Commission. By Colonel Kenneth Mackay C.B. Pp. xvi+192. (London: Witherby and Co.) Price 7*s.* 6*d.* net.